In the parent application, claims 1-3 and 5-6 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,880,018 to Boeck et al. ("the Boeck et al. '018 patent"). This rejection is respectfully traversed.

With regard to independent claim 1 of the present application, Applicants describe and claim forming a first sacrificial dielectric layer above a structure layer and adjacent a contact, forming a second sacrificial dielectric layer above the first sacrificial dielectric layer and the contact, and forming an opening in the sacrificial dielectric layer, wherein at least a portion of the opening is above at least a portion of the contact. Applicants further describe and claim forming a copper layer above the second sacrificial dielectric layer and in the opening, forming the copper interconnect by removing portions of the copper layer above the second sacrificial dielectric layer, leaving the copper interconnect in the opening, and removing the first and second sacrificial dielectric layers. Furthermore, Applicants describe and claim forming a low dielectric constant dielectric layer above the structure and adjacent the copper interconnect and the contact. Independent claim 11 of the present application further specifies forming at least one barrier metal layer and a copper seed layer above the second sacrificial dielectric layer and in the opening, and electrochemically depositing copper above the copper seed layer above the at least one barrier metal layer.

The Examiner has identified the sacrificial layer 18 and the structure layer 16/12 indicated in Figure 1 of the Boeck et al. '018 patent as being relevant to the claims. However, the Boeck et al. '018 patent is completely silent with regard to forming a first sacrificial dielectric layer above a structure layer and adjacent a contact, forming a second sacrificial dielectric layer above the first sacrificial dielectric layer and the contact, and forming an opening in the sacrificial dielectric layer, wherein at least a portion of the opening is above at least a portion of

the contact. The Boeck et al. '018 patent is also completely silent with regard to removing the first and second sacrificial dielectric layers and forming a low dielectric constant dielectric layer above the structure and adjacent the copper interconnect and the contact.

In the parent application, claims 4 and 7-40 were rejected under 35 U.S.C. §103(a) as being obvious over the Boeck et al. '018 patent in view of one or more of U.S. Patent No. 6,037,664 to Zhao et al. ("the Zhao et al. '664 patent") and U.S. Patent No. 6,010,962 to Liu et al. ("the Liu et al. '962 patent"). Claims 21-40 have been withdrawn, rendering the Examiner's rejections of these claims moot. The remaining rejections of claims 4 and 7-20 are respectfully traversed.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). The Examiner relies on the Liu et al. '962 patent to teach forming a barrier layer inside the opening and forming a copper seed layer. The Examiner also relies on the Zhao et al. '664 patent to teach forming and patterning a mask layer. However, the Zhao et al. '664 patent and the Liu et al. '962 patent fail to remedy the fundamental deficiencies of the Boeck et al. '018 patent, as discussed above. Thus, it is respectfully submitted that the prior art references when combined do not teach or suggest all the claim limitations.

New claims 41 and 42 depend from independent claims 1 and 11, respectively. Thus, for at least the aforementioned reasons, Applicants respectfully submit that claims 41 and 42 are allowable over the prior art of record.

In view of the foregoing, it is respectfully submitted that the application and all of the claims, as amended, are in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Houston, Texas telephone number (713) 934-4052 to discuss the steps necessary for placing the application in condition for allowance.

Respectfully submitted,

Date: 9/4/02

Mark W. Sincell, Ph.D.
Reg. No. 52,226
WILLIAMS, MORGAN & AMERSON, P.C.
7676 Hillmont, Suite 250
Houston, Texas 77040
(713) 934-4051
(713) 934-7011 (facsimile)

AGENT FOR APPLICANTS

AMENDED AND NEW CLAIMS FOR SERIAL NO. 10/045,895

1. A method of forming a copper interconnect, the method comprising:

forming a first sacrificial dielectric layer above a structure layer and adjacent a contact;

forming a second sacrificial dielectric layer above [a structure layer] the first sacrificial dielectric layer and the contact;

forming an opening in the sacrificial dielectric layer, wherein at least a portion of the opening is above at least a portion of the contact;

forming a copper layer above the second sacrificial dielectric layer and in the opening;

forming the copper interconnect by removing portions of the copper layer above the second sacrificial dielectric layer, leaving the copper interconnect in the opening;

removing the first and second sacrificial dielectric layers [above the structure and adjacent the copper interconnect]; and

forming a low dielectric constant dielectric layer above the structure and adjacent the copper interconnect and the contact.

5. (Amended) The method of claim 1, wherein forming the low dielectric constant dielectric layer includes forming the low dielectric constant dielectric layer using one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and spin-on glass [thermal growing].

6. (Amended) The method of claim 1, wherein forming the second sacrificial dielectric layer includes forming the second sacrificial dielectric layer out of one of an oxide, an oxynitride, silicon dioxide, a nitrogen-bearing oxide, a nitrogen-doped oxide, silicon oxynitride, a high dielectric constant (high K), where K is at least about 8, titanium oxide, tantalum oxide, barium strontium titanate, and forming the second sacrificial dielectric layer using one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and thermal growing.

7. (Amended) The method of claim 1, wherein forming the opening in the second sacrificial dielectric layer includes forming the opening in the second sacrificial dielectric layer using at least one of a mask of photoresist and an etch stop layer, the at least one of the mask of photoresist and the etch stop layer being formed and patterned above the sacrificial dielectric layer.

10. (Amended) The method of claim 9, wherein using the electrochemical deposition of the copper includes forming at least one barrier layer and a copper seed layer in the [second] opening before the electrochemical deposition of the copper, and planarizing the copper using chemical mechanical polishing after the electrochemical deposition of the copper.

11. (Amended) A method of forming a copper interconnect, the method comprising:

forming a first sacrificial dielectric layer above a structure layer and adjacent a contact;

forming a second sacrificial dielectric layer above [a structure layer] the first sacrificial dielectric layer and the contact;

forming an opening in the second sacrificial dielectric layer, wherein at least a portion of the opening is above at least a portion of the contact;

forming at least one barrier metal layer and a copper seed layer above the second sacrificial dielectric layer and in the opening;

electrochemically depositing copper above the copper seed layer above the at least one barrier metal layer;

forming the copper interconnect by removing the copper and the at least one barrier metal layer and the copper seed layer above the second sacrificial dielectric layer, leaving the copper interconnect in the opening;

removing the first and second sacrificial dielectric layers [above the structure layer and adjacent the copper interconnect]; and

forming a low dielectric constant dielectric layer above the structure and adjacent the copper interconnect and the contact.

15. (Amended) The method of claim 11, wherein forming the low dielectric constant dielectric layer includes forming the low dielectric constant dielectric layer using one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and spin-on glass [thermal growing].

16. (Amended) The method of claim 11, wherein forming the second sacrificial dielectric layer includes forming the second sacrificial dielectric layer out of one of an oxide, an

oxynitride, silicon dioxide, a nitrogen-bearing oxide, a nitrogen-doped oxide, silicon oxynitride, a high dielectric constant (high K), where K is at least about 8, titanium oxide, tantalum oxide, barium strontium titanate, and forming the second sacrificial dielectric layer using one of chemical vapor deposition (CVD), low-pressure CVD (LPCVD), plasma-enhanced CVD (PECVD), sputtering, physical vapor deposition (PVD), and thermal growing.

17. (Amended) The method of claim 11, wherein forming the opening in the second sacrificial dielectric layer includes forming the opening in the second sacrificial dielectric layer using at least one of a mask of photoresist and an etch stop layer, the at least one of the mask of photoresist and the etch stop layer being formed and patterned above the second sacrificial dielectric layer.

41. (New) The method of claim 1, wherein forming the first sacrificial dielectric layer adjacent the contact comprises forming the first sacrificial layer adjacent an intermetal via connect.

42. (New) The method of claim 11, wherein forming the first sacrificial dielectric layer adjacent the contact comprises forming the first sacrificial layer adjacent an intermetal via connect.